



## Fact Sheet:

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### **LOW COST EMP/EMI TEMPEST SHIELDING TECHNOLOGY**

#### **The Problem**

Dependence on electronic systems for military and other national security command, communications, control, computing, data processing, and intelligence continues to increase. The state-of-the-art electronics components used in most systems are susceptible to upset or damage from Electromagnetic Interference (EMI), including the Electromagnetic Pulse (EMP) from nuclear weapons. Further, to ensure communications security (TEMPEST), it is often necessary to prevent compromising emanations. Many defense-related facilities require EMI, EMP, or TEMPEST protection. Historically, a metallic liner or shield has provided protection by completely enclosing the electronics systems. The conservative designs typically provide more shielding than required and are very expensive to design, construct, test, and maintain.

#### **The Technology**

The U.S. Army Construction Engineering Research Laboratories (CERL) has been experimenting with low-cost electromagnetic shielding designs for several years. These studies can be categorized as follows:

1. **New Materials Development:** Materials included are conductive polymers and advanced coatings for use on shield components. Materials being considered include amorphous metals and intercalated graphites. Consideration is also being given to making concrete electrically conductive.

2. Use of Inherent Shielding of Standard Construction Materials: Examples include aluminum-foil-backed gypsum board, aluminum-foil-backed insulating sheathing, metallic-clad siding, copper foils (normally used for vapor barriers), wire meshes, and sheet metal roofing.
3. Adaptation of Application Techniques: These techniques include the use of thermal spraying (primarily arc-spraying) of metals in which molten metal is sprayed in much the same manner as paint is sprayed. This metal bonds to most construction surfaces. Another technique is the use of laser welding to allow efficient welding of thinner sheet metals than conventional methods.
4. New Construction Assembly Techniques: This effort includes an investigation of seam-joining techniques for thin sheet metals, such as galvanized steel, metal meshes, aluminum panels, and copper sheets.

#### **Benefits/Savings**

This research is expected to result in significant cost-reductions for electromagnetically shielded rooms or buildings. Cost reductions will result in more widespread use of shielding, thus improving overall communications security, resistance to electromagnetic interference upset, and increased probability of surviving nuclear events.

#### **Status**

1. CERL has completed numerous arc-spray experiments and several arc-sprayed rooms and has obtained TEMPEST certification for them. One room used a unique design of copper sprayed onto fiberglass, and the project resulted in an Army Research and Development Achievement award. Current and future studies include evaluation of varying arc-spray parameter effects on the quality of coatings, investigation of the use of electromagnetic propulsion for arc spray, and use of highly flexible arc-sprayed substrates. In addition, two rooms have been installed as field-demonstrations.
2. Several candidates for advanced coatings have been identified to improve shield penetration designs.

3. A relatively new commercial design that uses snap-together joints and galvanized sheet steel has been evaluated in the laboratory and found to be acceptable for most TEMPEST designs.
4. In a current study, laser welding using fiber-optic delivery of laser-welding power is being investigated. This approach will allow for construction of large shielded volumes with non-portable welders and the use of much thinner steel than that used in conventional welded steel shields.
5. Additional details are available in the following CERL technical reports: M-86/11, Development, Design, Construction, and Testing of a Copper Arc-Sprayed Shielded Enclosure, July 1986; M-86/19, Electromagnetic Shielding Tests on a Room Shielded with Foil-Faced Foam Board, September 1986; and M-88/02, Low Cost Electromagnetic Shielding Using Drywall Composites: Results of RFI Testing of Shielding Effectiveness, October 1987; and M-92/06, Effectiveness of Low-Cost Electromagnetic Shielding Using Nail-Together Galvanized Steel: Test Results, September 1992.

#### **Point of Contact**

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